Structural Idealism with Everettian Dynamics

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In this brief and informal paper I will propose a novel metaphysical theory called Structural Idealism with Everettian dynamics (SIE), which combines ontic structural realism, ontological idealism, and Everett's interpretation of quantum mechanics. I first lay out the postulates of Structural Idealism, and show how an apparent paradox necessitates an Everettian interpretation. Then I argue that the theory is conceivably consistent with modern physics. I further discuss how to classify the ontology of the theory, how its nomology arises non-contingently as what Wheeler called a "law-without-law", and what other philosophical problems this approach does and does not address.

1 Postulates of SIE

I start with two motivating postulates about the ontology of consciousness. The first postulate is arguably self-evident and implies the second postulate, but I won't be providing any detailed arguments here; there has already been enough ink spilled on these subjects in the literature, with people changing their minds very rarely. The aim of this paper is rather to motivate and discuss the plausibility of the third, fourth and fifth postulates.

Postulate 1: Fundamentality of Consciousness

By this I mean that conscious experience is not an illusion or weakly emergent. This claim is agreed upon by every school of thought in the philosophy of mind except for the illusionist camp exemplified by Dennett.

Postulate 2: Ontic Structural Realism about Consciousness (OSRC)

Ontic Structural Realism (OSR) is the school of thought which claims that intrinsic properties are grounded in relational or structural properties. By OSR about consciousness (OSRC) I mean (in short) that consciousness corresponds to computational processes in some sense. It is thus "hardware independent", i.e.

it doesn't matter whether a computation is instantiated in grey matter, silicon, or some other medium. There are some good arguments against this view, but many of them may not pertain to the interpretation of structuralism we will develop in SIE.

Assuming postulate 1, the most popular alternative to structuralism about consciousness is Russellian Monism, the view that consciousness is an intrisinc property of micro-physical entities. The trouble with such views is that they must first explain how collections of micro-physical entities only produce complex consicous experiences when they are arranged in certain physical structures (the combination problem), and then they must explain how they are not then just structuralists but with an extra assumption.

There have been many attempts to find a rigorous mathematical framework for the computational structures which, according to OSRC, must be mapped onto intervals of conscious experience.[1] We will not attempt to find such a mathematical framework here, but will merely assume that such a framework must exist. For maximum generality, we will also assume that the framework must be equiped with a notion of parallel computation as well as sequential computation. Thus the framework we need must be a kind of network theory, in which there exist a set of primitive computations with a certain number of inputs and outputs, and we can imagine wiring together simple computations to create more complex computations. In order for the mapping from computational structures to phenomenal experiences to be consistent, we must also assume that the preferred mathematical network theory must be unique up to isomorphism.

> **Postulate 3**: There exists a "preferred" network theory to model intervals of conscious experience which is unique up to isomorphism.

Functionalism and some forms of epiphenomenal dualism accept a version of the first three postulates, and then propose that a conscious experience is "actualized" if and only if it a corresponding network structure is "instanstiated" or "implemented" in material structures. These views might be the most amenable to common sense, but they run into the well known problem that any computation can be mapped onto any physical system.[2] Therefore, we appear to be at a dead end. As Chalmer's puts it, "No position on the mind–body problem is plausible.[3]" With no good options on the table we are motivated to consider more radical ontologies, and noting that materialism appears to be incompatible with OSRC, we propose a kind of ontological idealism:

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[1] Stanford Encyclopedia of Philosphy (2025) "Computation in Physical Systems."
[2] See for example David J Chalmers (1996) "Does a Rock Implement Every Finite-State Automaton?"
[3] David J Chalmers, "Idealism and the Mind-Body Problem". Preprint at https://consc.net/papers/idealism.pdf

Postulate 4: The interval of conscious experience corresponding to each constructable network in the preferred network theory is actually experienced, without conditions on instatiation.

We can call this the postulate of Structural Idealism (SI), and like all forms of idealism this resolves the hard problem of consciousness, i.e. the mind-matter explanatory gap, by simply removing the matter, but in its place lies what seems like an equally hard problem: explaining why it seems like there is an external reality which follows consistent physical laws. With SI in particular this takes the form of a kind of Boltzmann brain paradox, as it would seem that any experience would be equally likely to follow any other experience. To address this, we begin by trying to make this paradox more precise.

Let's say $\mathbf{\Gamma}$ is the infinite set of all constructable networks in the preferred network theory. To be as general as possible, we say that each element in $\mathbf{\Gamma}$ corresponds to an "interval" of conscious experience. Note that in any diagrammatic language to represent computations, such as abstract neural networks, there are an infinite number of ways to represent the same computation. So we assume that there exists an equivalence relation Ω on $\mathbf{\Gamma}$, such that equivalent graphs correspond to indistinguishable intervals of conscious experiences. We imagine that two networks in $\mathbf{\Gamma}$ might be wired together sequentially in order to create a new network which corresponds to an "extended experience". Define the function E as the number of ways that two networks in $\mathbf{\Gamma}$ can be wired together sequentially.

Absolute probabilities are trivial in SI , as all possible experiences are actualized with probability of one. Rather, given some initial experience A, we consider only the relative probability that A will be immediately followed by experience B vs experience C.

Postulate 5: For three elements of Ω: A, B, and C, the relative probability of experiencing B vs. C immediately after A is given by the expression:

$$\frac{\sum_{i \in A} \sum_{j \in B} E(i,j)}{\sum_{i \in A} \sum_{k \in C} E(i,k)}$$

which does not always equal one.

SI implies that every possible extension is actualized, every conscious experience branching off into every other possible experience. Postulate 5, which we might call the postulate of Everettian dynamics, conjectures that because of the symmetries and structure in the preferred network theory, that the branching extensions would not be purely random, and thus would follow a kind of probabilistic law. The core idea of Structural Idealism with Everettian dynamics (SIE) is that this structure of probabilistic

branching implied by our postulates is identical to the structure of probabilistic branching from Everett's many-worlds interpretation of quantum mechanics. In other words, we conjecture that the "Boltzmann brain problem" with Structural Idealism is not a paradox, but rather is the source of physical laws.

This is a very outlandish idea which seems to provide more questions as answers, and despite considering SIE occasionally for a few years I have not made any significant progress on developing the mathematical and conceptual details. Thus we leave a more rigorous treatment to future works and hopefully more capable mathematicians and philosophers, and in the next section we argue only that such a theory could in principle be consistent with modern physics.

2 Physics from the Combinatorics of Networks

Materialism, even without the mind-body problem, is not nearly as unproblematic and amenable to common sense as many people imagine. As David Wallace put it : "The popular impression of particle physics as about the behavior of lots of little point particles whizzing about bears about as much relation to real particle physics as the earth/air/fire/water theory of matter bears to the Periodic Table."[4] In this section I'll argue for the conceivability of SIE by providing examples of how modern physics seems to bear more relation to a statistical theory of the combinatorics of networks than it bears relation to any sort of common sense ontology. Then I will comment on a tentative but intriguing link between idealism more generally and the holographic principle.

A complete theory of physics must reconcile quantum mechanics and general relativity, and there are essentially two strategies to achieve this: we may either think of spacetime as fundamental and try to find a way to quantize it, or we may suppose that spacetime is emergent and attempt to build it from discrete quantum processes. Loop Quantum Gravity (LQG) is the leading research program which takes the emergent spacetime view. LQG build's on Penrose's idea of spin-networks, which states that if we look at networks where the edges represent quantum spin, and consider how we might combine such networks in ways that conserve angular momentum, that we naturally arrive at a three dimensional space. Loop quantum gravity then attempts to model space-time using a kind of sum-over-paths of such networks, also known as a spin foam.[5] Thus it is conceivable that space could emerge from the combinatorics of background independent networks as in SIE.

[4]David Wallace (2011) "A prolegomenon to the ontology of the Everett interpretation". Wallace was not arguing against materialism but the point still stands.
[5]John Baez (1999) "An Introduction to Spin Foam Models of BF Theory and Quantum Gravity" provides a good introduction to both spin-networks and spin foams.

We likewise need only to point to existing literature to see that Quantum Field Theory (QFT) is plausibly compatible with SIE. In order to calculate the probability of a process in QFT, one must consider every possible feynman diagram that could represent that process. This is highly suggestive that the underlying ontology of QFT in some sense be a theory of the combinatorics of networks, rather than a theory of fields and/or particles. This suggestion is perhaps made more explicit in recent work on formulations of quantum field theory from a combinatorial perspective.[6]

Furthermore, the apparent necessity of evaluating divergent sums in order to calculate probabilities for even the simplest interactions in particle physics, which seems very odd from a materialist perspective, would be naturally explained by SIE: as our equivalence classes of the preferred network theory each have infinite members, the numerator and denominator of our relative probability function will generally diverge, and to make predictions it is not surprising that we have to resort to what Feynman called the "hocus-pocus" of perturbation and renormalization in order to find approximate solutions.

We also know that all of the fermions and gauge bosons of the standard model are generated (in a sense) from curious "internal" gauge symmetries which defy common sense intuition. According to SIE, all physical laws are nothing more than reflections of the symmetry of the underlying ontology (the preferred network theory), thus it provides an explanation of why the gauge symmetries of particle physics seem more fundamental than the particles.

While it is therefore conceivable that general relativity, the standard model, and QFT may emerge from the combinatorics and symmetries of a theory of background independent networks, this may not be enough to adequately explain how seemingly "internal" or perceptual states can create the illusion or emergence of "external" reality. SIE (and naturalist idealism more generally) therefore seems to require that there be a dual description of physics, where instead of physical laws acting on a 3+1 dimensional "external" space, they act only on what we might call an observer's "perceptual space", i.e. the space of information which is incident on an observer.

Intriguingly, spacetime seems to come equipped with a natural way to describe an observer's perceptual space, as Penrose and Rindler explain in "Spinors and Spacetime", "[An observer] can imagine himself permanently situated at the centre of a unit sphere S (his sphere of vision) onto which he maps all he sees at any instant. ...Each light ray entering his eye is represented by a null straight line through O and hence by a single point of his *celestial sphere*", where the celestial sphere is defined as the two dimensional projection of the lightlike boundary of an observer's past light cone.

[6] See for example Karen Yeats (2017) "A Combinatorial Perspective on Quantum Field Theory" and Dirk Kreimer (2024) "Anatomy of a Gauge Field"

A mysterious property of relativity is that the symmetry group of rotations and boosts in four dimensional spacetime (the lorentz group) is isomorphic to the two dimensional symmetry group of conformal transformations on an observer's celestial sphere.[7] This provides a hint that perhaps there exists a holographic principle which maps physics in a three dimensional common sense picture of reality to a two dimensional theory which acts only on an observer's celestial sphere, and the research program known as Celestial Holography[8] attempts to find such a holographic duality. Thus, not only does modern physics give us a natural way to describe a map between the common sense, three dimensional picture of external reality to a two dimensional, perceptual space of "internal" reality, it is plausible that we might discover an exact correspondence between these two pictures, which would allow us to suppose that the internal or perceptual space is ontologically fundamental, while the external picture is emergent. [9]

All of the above examples are little more than hand-waving and vague suggestions, but taken together they paint a picture of how it is not only plausible that SIE could be true, but that it may be able to explain some of the most mysterious aspects of modern physics.

3 Ontology and Nomology

I conclude with some comments on how this theory might be classified and what it has to say about a few philosophical questions.

First, as to the philosophy of mind, SIE provides a self-consistent solution to the mind-body problem by, as I noted earlier, simply removing all material bodies. However, as a deterministic and naturalist theory it does not leave room for the causal powers of mental dispositions, thus free will would be a weakly emergent phenomenon. Many philosophers of mind will find this unacceptable for various reasons, but I personally do not. Also, as all Everettian ontologies, it profoundly muddles the notion of personal identity. But as noted by Everett with his analogy of splitting amoebas, which are constantly dividing and yet objectively exist, this does not make an ontology inconsistent[10]. This state of affairs, along with other unintuitive aspects of a "many-worlds" ontology, may likewise be disconcerting if not disqualifying to many philosophers, but to those of us who are convinced of the necessity and self-consistency of the Everett interpretation it is a small price to pay and nothing new.

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[7] Blagoje Oblak (2018) "From the Lorentz Group to the Celestial Sphere"
[8] See Ana-Maria Raclariu (2021) "Lectures on Celestial Holography" for an overview. To be clear, this research program does not explicitly have anything to do with idealism or "perceptual space".
[9] This correspondence between idealism and holography is tentative and hypothetical, but it is an interesting thought which I hope to explore further in a future work.
[10] See "The Amoeba Metaphor", an excerpt from an early draft of Everett's dissertation. Published online by PBS here: https://www.pbs.org/wgbh/nova/manyworlds/orig-01.html.

As for how to classify the ontology of the theory: It seems most natural to call this theory idealist and monist, as the fundamental entities are essentially mental. However it might be argued to be dualist, as there are in a sense structural/mathematical/physical properties as well as phenomenal properties. Though if it is dualist, it does not seem to be susceptible to many of the familiar refutations, as these structural properties are not causally disconnected from the phenomenal properties. It may also be thought of as a kind of pythagoreanism, as our underlying network theory is purely abstract and mathematical. If so, it does not seem to fall prey to the same counter arguments as other pythagorean ontologies like Tegmark's "mathematical universe hypothesis" which does not take the Boltzmann brain problem as the source of physical laws, but rather tries to get rid of it by postulating some arbitrary extra conditions on what mathematical structures are "real"[11]. Sticking with the idealist label and using Chalmers' classification scheme,[12] I'll suggest that the theory is a kind of objective, realist, and "micro" idealism.

The most striking features of SIE are its minimalist ontology and emergent nomology. All materialist ontologies make use of "brute fact" to explain the structure and existence of material reality, whether the material in question is fundamentally composed of particles, fields, wavefunctions, strings, spin-foam, or something else. All metaphysical theories of physical laws (that I'm aware of) likewise lack any sort of unifying explanatory principle. However, in SIE the only "brute fact" that we must assume is the nature of the preferred network theory which forms the basis of our ontology, but the hope is that this might be an exceptionally "natural" way to represent computations qua consciousness, and thus may not seem so brute after all. All of the postulates presented in section one are (arguably) metaphysically necessary, i.e. they are self-evident or must be assumed in order to begin to reason about metaphysics. Therefore, SIE may meet Deustch and Wheeler's demand for an "all-explanatory physical principle" which entails a "law-without-law"[13].

Thus, there are three reasons to be interested in such an unintuitive, radical, ill-defined, and perhaps disconcerting theory. First, it does not seem any more implausible than other strategies to make sense of the hard problem of consciousness. Second, it provides an explanation of the existence and uniqueness of reality with minimal invocation of "brute fact". Lastly, it would explain some of the most mysterious properties of quantum field theory and relativity, and if further developed, would perhaps serve to guide future research in theoretical physics.

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[11] Max Tegmark (1998) "Is 'the theory of everything' merely the ultimate ensemble theory?"
[12] David J Chalmers, "Idealism and the Mind-Body Problem".
[13] David Deutsch (1985) "On Wheeler's Notion of 'Law without Law' in Physics."